LOK SABHA SECRETARIAT
Research and Information Division

INFORMATION BULLETIN

No. LARRDIS (PP) 2013/IB-1 APRIL 2013

POWER SECTOR : ISSUES & CHALLENGES

Electricity is a Concurrent Subject at Entry 38 in List III of the Seventh Schedule to the Constitution of India.

Electricity is an essential requirement for all facets of our life. It has been recognized as a basic human need. It is a critical infrastructure on which the socio-economic development of the country depends. Supply of electricity at reasonable rate to rural India is essential for its overall development. Equally important is the availability of reliable and quality power at competitive rates to Indian industry to make it globally competitive and to enable it to exploit the tremendous potential of employment generation. Availability of quality supply of electricity is very crucial to the sustained growth of the Services Sector. All efforts need to be made to ensure that all bottlenecks are removed in the path of timely implementation of power projects and transmission network.

Power for All

The Government's Mission was to provide quality and reliable power to all by 2012 but the Grid Failures on 30 and 31 July 2012, considered to be one of the biggest grid failures in the world, have raised questions about the management of power situation in India.

Mission 2012: Power for All

A comprehensive Blueprint for Power Sector development was prepared encompassing an integrated strategy for the sector development with following objectives:

- Sufficient power to achieve GDP growth rate of 8 per cent
- Reliable power
- Quality power
- Optimum power cost
- Commercial viability of power industry
- Power for all

This mission aimed at having 2,00,000 MW installed generation capacity by 2012.

INSTITUTIONAL SET UP

Ministry of Power

The Ministry of Power is primarily responsible for the development of electrical energy in the country. The Ministry is concerned with perspective planning, policy formulation, processing of projects for investment decisions, monitoring of the implementation of power projects, training and manpower development and the administration and enactment of legislation with regard to thermal and hydro power generation, transmission and distribution. In all technical matters, the Ministry of Power is assisted by the Central Electricity Authority (CEA). Rechristened from the Ministry of Energy, the Ministry of Power started functioning independently from 2 July 1992. The Ministry of Power is responsible for the administration of the Electricity Act, 2003; the Energy Conservation Act, 2001 and to undertake such amendments to

these Acts, as may be necessary from time to time, in conformity with the Government's policy objectives. CEA a Statutory Body constituted under the erstwhile Electricity (Supply) Act, 1948, hereinafter replaced by the Electricity Act, 2003 and an attached office of Ministry of Power is responsible for the technical coordination and supervision of programmes and is also entrusted with a number of statutory 'unctions.

NATIONAL ELECTRICITY POLICY, 2005

The National Electricity Policy aims at laying guidelines for accelerated development of the power sector, providing supply of electricity to all areas and protecting interests of consumers and other stakeholders keeping in view availability of energy resources, technology available to exploit these resources, economics of generation using different resources, and energy security issues. The National Electricity Policy has been evolved in consultation with and taking into account views of the State Governments, Central Electricity Authority (CEA), Central Electricity Regulatory Commission (CERC) and other stakeholders. The National Electricity Policy aims at achieving the following objectives:

- Access to Electricity — Available for all households in next five years.
- Availability of Power — Demand to be fully met by 2012. Energy and peaking shortages to be overcome and adequate spinning reserve to be available.
- Supply of Reliable and Quality Power of specified standards in an efficient manner and at reasonable rates.
- Per capita availability of electricity to be increased to over 1000 units by 2012.
- Minimum lifeline consumption of 1 unit/household/day as a merit good by year 2012.
- Financial Turnaround and Commercial Viability of Electricity Sector.
- Protection of consumers' interests.

In addition, Ministry of Power exercises administrative control over the following PSUs/autonomous bodies:—

(a) National Thermal Power Corporation (NTPC)
(b) National Hydroelectric Power Corporation Ltd. (NHPC)
(c) Tehri Hydro Development Corporation (THDC)
(d) North Eastern Electric Power Corporation Limited (NEEPCO)
(e) Power Grid Corporation of India Ltd. (PGCIL)
(f) Satluj Jal Vidyut Nigam Limited (SJVNL)
(g) Rural Electrification Corporation Ltd. (REC)
(h) Power Finance Corporation Ltd. (PFC)
(i) Bureau of Energy Efficiency (BEE)
(j) National Power Training Institute (NPTI)
(k) Central Power Research Institute (CPRI)

Ministry of New and Renewable Energy

The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The broad aim of the Ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country. The role of new and renewable energy has been assuming increasing significance in recent times with the growing concern for the country's energy security. Energy self-sufficiency was identified as the major driver for new and renewable energy in the country in the wake of the two oil shocks of the 1970s. The sudden increase in the price of oil, uncertainties associated with its supply and the adverse impact on the balance of payments position led to the establishment of the Commission for Additional Sources of Energy (CASE) in the Department of Science & Technology in March 1981. The Commission was charged with the responsibility of formulating policies and their implementation, programmes for development of new and renewable energy apart from coordinating and intensifying Research and Development in the Sector. In 1982, a new department, *i.e.*, Department of Non-conventional Energy Sources (DNES), that incorporated CASE, was created in the then Ministry of Energy. In 1992, DNES became

the Ministry of Non-conventional Energy Sources. In October 2006, the Ministry was renamed as the Ministry of New and Renewable Energy. The Mission of the Ministry is to ensure:—

(a) Energy Security;
(b) Increase in the share of clean power;
(c) Energy Availability and Access;
(d) Energy Affordability;
(e) Energy Equity.

Department of Atomic Energy

The Department of Atomic Energy (DAE) was set-up on 3 August 1954 under the direct charge of the Prime Minister through a Presidential Order. The vision of the DAE is to empower India through technology, creation of more wealth and providing better quality of life to its citizens. This is to be achieved by making India energy independent, contributing to provision of sufficient, safe and nutritious food and better health care to our people through development and deployment of nuclear and radiation technologies and their applications. Nuclear Power Corporation of India Limited (NPCIL) is the Public Sector Enterprise, working under the aegis of Department of Atomic Energy and was set up with the objective of operating atomic power stations and implementing the atomic power projects for generation of electricity in pursuance of the schemes and programmes of the Government of India.

Capacity Addition

Electricity is a vital input for economic growth and social development. As the Indian Economy pushes forward, it is necessary to continue providing continuous and adequate power to all sectors of economy. As on 30 June 2012, installed generating capacity in the country was approximately 2,05,340.26 MW, thereby meeting the target set under the Mission 'Power for All'.

The source-wise details along with its share are given below:—

Type	Installed Capacity (MW)	Share (per cent)
Hydro	39,291.40	19.1
Thermal	136,436.18	66.4
Nuclear	4,780	2.3
R.E.S.*	24,832.68	12.1
Total	205,340.26	100.0

*R.E.S. includes Small Hydro/Biomass/Urban & Industrial Waste power/Wind power, etc.

The Plan-wise Targets and Achievements of Capacity Addition are as under:—

Plan	Target (MW)	Achievement (MW)	Per cent of Target
1st (51-56)	1,300	1,100	84.6
2nd (56-61)	3,500	2,250	64.3
3rd (61-66)	7,040	4,520	64.2
4th (69-74)	9,264	4,579	49.5
5th (74-79)	12,499	10,202	81.6
6th (80-85)	19,666	14,226	72.3
7th (85-90)	22,245	21,401	96.2
8th (92-97)	30,538	16,423	53.8
9th (97-02)	40,245	19,015	47.5
10th (02-07)	41,110	21,180	51.5
11th (07-12)	62,374 (Mid-term Appraisal)	54,964	88.1

A target of capacity addition of 62,374 MW was fixed by the Mid-term Appraisal (MTA) carried out by the Planning Commission for the 11th Plan. As against this, the generation capacity addition achieved during the 11th Plan was 54,964 MW which is the highest capacity addition amongst all Plans. The details are as under:—

(in MW)

	Hydro	Thermal	Nuclear	Total	Per cent
Central Sector	1550	12790.0	880	15220.0	27.7
State Sector	2702	14030.4	0	16732.4	30.4
Private Sector	1292	21719.5	0	23011.5	41.9
Total	**5544**	**48539.9**	**880**	**54963.9**	
Percentage	10.1	88.3	1.6		

The accelerated pace of capacity addition in the last five years is largely a consequence of several key measures initiated by the Ministry of Power which include augmentation of domestic manufacturing capacity of power plant equipment, adoption of super critical technologies, liberalization of the mega power policy, instituting a robust monitoring mechanism and enhancing the availability of skilled and trained manpower. Several initiatives are also underway to augment domestic manufacturing capacity for main plant and Balance of Plants.

Capacity addition during the 12th Plan

As per the report of Working Group on Power for the 12th Plan, a capacity addition of 75,785 MW, comprising 19,858 MW in the Central Sector, 13,796 MW in the State Sector and 42,131 MW in Private Sector has been recommended to Planning Commission during 12th Plan on an all India basis. However, the capacity addition target of 75,785 MW was based on achievement of MTA target of 62,374 MW. As the actual capacity addition during 11th Plan has been 54,964 MW, the capacity addition target for the 12th Plan has been reworked to be 84,756 MW. The capacity addition target for 12th Five Year Plan is yet to be finalized by the Planning Commission.

Electricity Generation

During 2011-12, the electricity generation was 876.887 Billion Unit (BU) as compared to the generation target 855 BU, representing an achievement of 102.56 per cent as well as significant growth of 8.11 per cent over the actual generation of 811.143 BU during 2010-11. Category-wise details are as under:—

Type	Generation Target 2011-12 (BU)	Actual Generation 2011-12 (BU)	Achievement *vis-à-vis* Target (per cent)	Actual Generation 2010-11 (BU)	Growth in Actual Generation in 2011-12 over 2010-11 (per cent)
Thermal	712.234	708.806	99.52	665.008	6.59
Nuclear	25.130	32.287	128.48	26.266	22.92
Hydro	112.050	130.510	116.47	114.257	14.22
Bhutan Import	5.586	5.284	94.60	5.611	(-)5.82
Total	855.000	876.887	102.56	811.143	8.11

A generation target of 930 (BU) for the year 2012-13 has been fixed by the Planning Commission. Details are as under:—

Category	Generation Target (BU)
Thermal	767.275
Nuclear	35.200
Hydro	122.045
Bhutan Import	5.480
Total	930.000

During April-October 2012, total electricity generation in the country was 533.979 (BU) against a target of 533.182 BU, representing an achievement of 100.15 per cent and a growth of 4.82 per cent over the actual generation of 509.429 BU during the same period of the year 2011-12. Category-wise break-up of generation target and the actual generation are as under:—

Type	Generation Target: 2012-13* (BU)	Actual Generation: 2012-13* (BU)	Achievement *vis-à-vis* Target (per cent)	Actual Generation: 2011-12* (BU)	Growth in Actual Generation in 2012-13* over last year's generation 2011-12* (per cent)
Thermal	425.923	431.246	101.25	394.097	9.43
Nuclear	18.947	19.133	100.98	18.729	2.16
Hydro	83.90	79.168	94.36	91.99	-13.94
Bhutan Import	4.41	4.432	100.47	4.612	-3.93
Total	533.182	533.979	100.15	509.429	4.82

*April to October

Transmission

In our country thermal and hydro generation capacity, which comprise the bulk of the generation are located far off from the end-users since the fuel required (coal, gas and water) are concentrated away from the load centres. Hence an adequate, reliable and efficient transmission infrastructure is needed to ensure availability of electricity to end users.

The total capacity of AC sub-stations was 249439 Mega Watt Ampere (MVA) at the end of the 10th Plan and 399801 MVA at the end of the 11th Plan. The total HVDC terminal capacity was 8000 MW at the end of the 10th Plan and 11000 MW at the end of 11th Plan.

Development of a National Grid

In India, the need and importance of transporting bulk power over long distances across the regions efficiently and economically has been recognized and has resulted in the formation of a 'National Grid'. All major transmission lines in the country are being integrated into one grid. The objective of the National Grid is to ensure optimum utilization of generating resources, conservation of an eco-sensitive right of way and the flexibility to accommodate the uncertainty of generation plans. It also facilitates bulk exchange of power between various regions thereby meeting the demand in deficit regions. Four major power regions of the country namely, North-Eastern, Eastern, Western and Northern are now operating on a synchronous mode *i.e.* on the same frequency through AC Connection. Southern Region is connected to this synchronous grid through High Voltage Direct Current (HVDC) links. The total transmission capacity of the inter-regional transmission links at the end of the 11th Plan as on 31 March 2012 was 27,750 MW.

The Southern Region is also planned to be synchronously interconnected with the rest of the national power grid through two 765 KV single circuit lines between Raichur (Karnataka, SR) and Sholapur (Maharashtra, WR) by 2014. The additional links between the Southern and Western regions would enable increased transfer of power between Southern States and other States. Further, such augmentation of inter-regional capacity shall also facilitate integration of large renewable energy generation in Southern Region with rest of the country for its optimal utilization.

Distribution

To complement the increase in generation and transmission infrastructure capacities during 11th Plan, matching investments in sub-transmission and distribution infrastructure were planned. In 2006, the Ministry of Power notified the Rural Electrification Policy which aimed at providing access to electricity to all households and supply quality power to rural areas. Earlier rural electrification was being looked after by the respective State Governments. The Electricity Act, 2003 was amended in 2007 to make rural electrification a joint responsibility of Central and State Governments to achieve universal rural electrification.

The two major flagship programmes of the Ministry of Power are the Rajeev Gandhi Grameen Vidyutikaran Yojana (RGGVY) and the Restructured Accelerated Power Development and Reform Programme (R-APDRP).

Rajeev Gandhi Grameen Vidyutikaran Yojana (RGGVY)

Mere availability of power has no meaning unless the people living in far-flung areas have access to it. Towards this the Ministry of Power has introduced the scheme **Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)** in April 2005 for achieving the National Common Minimum Programme objective of providing access to electricity to all Rural Households. The Rural Electrification Corporation (REC) is the nodal agency for the programme. This programme has been brought under the ambit of Bharat Nirman.

Under this scheme, 90 per cent Capital Subsidy is provided for rural-electrification infrastructure through:—

(i) Creation of Rural Electricity Distribution Backbone (REDB) with one 33/11 kV (or 66/11 kV) substation in every block where it does not exist.
(ii) Creation of Village Electricity Infrastructure (VEI) for electrification of all un-electrified villages/habitations and provision of distribution transformer(s) of appropriate capacity in every village/habitation.
(iii) Decentralized Distributed Generation (DDG) and Supply System from conventional or renewable sources for Villages/Habitations where grid supply is not cost effective and where Ministry of New & Renewable Energy would not be providing electricity through their programmer(s).

Balance 10 per cent is to be contributed by States through its own resources or loan from financial institutions. The scheme also provides for free electricity connection to Below Poverty Line (BPL) households. The scheme aims at electrifying all unelectrified villages and providing access to electricity to all rural households.

Under the scheme, as on 15 November 2012, electrification of 1,06,019 unelectrified villages has been completed and free connection to 2.2 crore BPL households has been released.

Accelerated Power Development and Reform Programme

Due to lack of adequate investment on Transmission and Distribution (T&D) works, the T&D losses have been consistently on the higher side, and reached to the level of 32.86 per cent in the year 2000-01. In order to bring economic viability to the State Utilities it was essential to reduce these losses. As the T&D loss was not able to capture all the losses in the network, concept of Aggregate Technical and Commercial (AT&C) loss was introduced. AT&C loss captures technical as well as commercial losses in the network and is a true indicator of total losses in the system.

With the initiative of the Government of India and of the States, the ***Accelerated Power Development and Reform Programme (APDRP)*** was launched in 2002-03, for strengthening of Transmission and Distribution network and reduction in AT&C losses. The main objective of the programme was to bring AT&C losses below 15 per cent in five years in urban and in high-density areas. The programme, along with other initiatives of the Government of India and of the States, has led to reduction in the overall AT&C loss from 38.86 per cent in 2001-02 to 34.54 per cent in 2005-06. The commercial loss of the State Power Utilities reduced significantly during this period from Rs. 29331 crore to Rs. 19546 crore. The loss as percentage of turnover was reduced from 33 per cent in 2000-01 to 16.60 per cent in 2005-06.

The APDRP programme has been restructured by the Government of India, in order that reliable and verifiable baseline data of revenue and energy in APDRP Project areas is attained over an IT platform and that AT&C loss reduction is achieved on a sustained basis. Restructured APDRP was approved as Central Sector Scheme on 31 July 2008 with total outlay of Rs. 51.577 crore. Projects under the scheme are taken up in two parts. Part-A is for establishing IT enabled system for energy accounting/auditing and Supervisory Control and Data Acquisition (SCADA) for big cities (Population: 4 lakhs and Annual Energy Input: 350MU) whereas Part-B is for regular distribution upgradation and strengthening projects. Projects worth Rs. 32,323.70 crore (Part-A: Rs. 6,638.79 crore covering 1402 towns and 63 SCADA projects; Part B: Rs. 25,684.91 crores covering 1132 towns) have been sanctioned. So far Rs. 6304.98 crores have been released under the programme as loan against Part-A and Part-B projects for disbursement to State utilities.

OTHER PROGRAMMES AND PROJECTS

Conventional Sources of Energy

(i) ***Ultra Mega Power Project***—Ultra Mega Power Projects (UMPPs) Programme, which brings in private investment into power generation, was a major initiative of the 11th Plan. So far power purchase agreements have been signed for 4 UMPPs of 4,000 MW each on the basis of competitive tariff based bidding. They are

based in Sasan (Madhya Pradesh), Mundra (Gujarat), Krishnapatnam (Andhra Pradesh) and Tilaiya (Jharkhand). Out of these, two units of 800 MW of Mundra by Tata Power have been commissioned in March, 2012 and July, 2012 respectively. Twelve more super critical UMPPs are being planned covering Chhattisgarh, Gujarat, Tamil Nadu, Andhra Pradesh, Odisha, Maharashtra, Bihar and Karnataka. An important element of this programme is the induction of super critical technology, which is an important shift towards energy efficiency. Unfortunately some of these projects are plagued with uncertainties regarding fuel supply because they were based on imported coal and changes in Government policies in the countries, where the coal mines were located, have raised the cost of coal whereas the power tariff is based on a competitive bid which does not contain a provision for passing on such increases.

(ii) ***Super Critical Projects***—Thermal power stations based on sub-critical technology have efficiency ranging between 30 per cent and 33 per cent. To improve energy efficiency it was decided that new thermal power plants should be based on super critical or ultra super critical technology with efficiency of at least 38-40 per cent. About 40 per cent of the new units in the 12th Plan would be based on super critical technology whereas in the 13th Plan, this figure is expected to go up to 100 per cent. The Government of India has also approved the policy of encouraging domestic manufacturing of power plants based on super critical power equipments through Phased Manufacturing Programme (PMP) by bulk tendering of 11 units of 660 MW and 9 units of 800 MW capacity.

(iii) ***National Electricity Fund***—Government has approved a National Electricity Fund (Interest Subsidy Scheme) to provide interest subsidy on loans disbursed to the Distribution Companies (DISCOMS)—both in public and private sector, to improve the distribution network.

National Electricity Fund (Interest Subsidy Scheme) would provide interest subsidy aggregating to Rs. 8466 crore for a period of 14 years on loans disbursed to the DISCOMS—both in public and private sector, sanctioned during two years *i.e.* 2012-13 and 2013-14 to improve the distribution network for areas not covered by RGGVY and R-APDRP project areas. The preconditions for eligibility are linked to certain reform measures taken by the States and the amount of interest subsidy is linked to the progress achieved in reforms linked parameters. The nodal agency for National Electricity Fund would be REC.

(iv) ***Financial restructuring of State Distribution Companies***—Central Government has notified a scheme for Financial Restructuring of State Owned DISCOMS on 5 October 2012. The scheme contains various measures required to be taken by State DISCOMS and State Governments for achieving the financial turnaround of the DISCOMS by restructuring their debt with support through a Transitional Finance Mechanism by Central Government. The scheme will remain open up to 31 December 2012 unless extended by the Government of India. Support under the scheme will be available for all participating State owned DISCOMS having accumulated losses and facing difficulty in financing operational losses. The salient features of the scheme are as under:

(a) 50% of the outstanding short-term liabilities up to 31 March 2012 to be taken over by State Governments. This shall be first converted into bonds to be issued by DISCOMS to participating lenders, duly backed by State Government Guarantee. Takeover of liability by State Government from DISCOMS in the next 2-5 years by way of special securities and repayment and interest payment to be done by State Government till the date of takeover.
(b) Restructuring the balance 50% Shor Term Loan by rescheduling loans and providing moratorium on principal and the best possible terms for this restructuring to ensure viability of this effort.
(c) The restructuring/reschedulement of loan is to be accompanied by concrete and measurable action by the DISCOMS/States to improve the operational performance of the distribution utilities.
(d) For monitoring the progress of the turnaround plan, two Committees at the State and Central levels respectively are proposed to be formed.
(e) Central Government will provide incentive by way of grant equal to the value of the additional energy saved by way of AT&C loss reduction beyond the loss specified under R-APDRP and capital reimbursement of 25% of principal repayment by the State Government on the liability taken over by the State Government under the scheme.

INTERNATIONAL COOPERATION

During the last two years, the Union Government has signed following international MoUs for cooperation in Power Sector:

1. MoU signed with Bangladesh on 11 January 2010 for (a) cooperation in power generation, transmission, energy efficiency and development of various types of renewable energy; (b) consultancy services, training, research and development programme for development of human resource and enhancement of efficiency in the power sector;
2. With Sri Lanka on the feasibility study for interconnection of India-Sri Lanka Electricity Grids on 9 June 2010; and
3. With China on Cooperation on Green Technologies including energy conservation and energy efficiency, clean coal and modernisation of the Electrical Grid on 16 December 2010.

Following three Power Projects have been completed with the help of bilateral cooperation in Power Sector during the last three years:

1. HVDS (High Voltage Distribution System) in Haryana (Rural Electrification Corporation Ltd./KfW).
2. HVDS in Andhra Pradesh (Rural Electrification Corporation Ltd./KfW).
3. Bakreshwar Thermal Power Project Units 4 & 5 — WBPDCL (West Bengal Power Development Corporation Ltd.)/Japanese International Cooperation Agency.

NUCLEAR ENERGY

Nuclear Power Corporation of India Limited—Nuclear Power Corporation of India Limited (NPCIL) is a Public Sector Enterprise under the administrative control of the Department of Atomic Energy (DAE), Government of India. The Company was registered as a Public Limited Company under the Companies Act, 1956 in September 1987 with the objective of operating atomic power stations and implementing the atomic power projects for generation of electricity in pursuance of the schemes and programmes of the Government of India under the Atomic Energy Act, 1962. NPCIL is responsible for design, construction, commissioning and operation of nuclear power reactors and is presently operating 20 nuclear power reactors with an installed capacity of 4780 MW. The reactor fleet comprises of two Boiling Water Reactors (BWRs) and eighteen Pressurised Heavy Water Reactors (PHWRs) and includes RAPS-1(100 MW) owned by DAE, Government of India. Currently it has six reactors under various stages of construction totalling 4800 MW capacity.

Mission of the NPCIL

To develop nuclear power technology and to produce nuclear power as a safe, environmentally benign and economically viable source of electrical energy to meet the increasing electricity needs of the country.

Highest ever nuclear power generation of 32455 MUs was achieved in the year 2011-12, registering an increase in electricity generation of 23 per cent as compared to the generation in the previous financial year 2010-11. NPCIL continued its journey of operating reactors continuously without outages. So far ten reactors have registered continuous run of more than a year with TAPS-2 registering the longest of 590 days. NPCIL has consistently maintained overall availability factor of reactors above 80 per cent for many years and in the year 2011-12 it reached up to 91 per cent.

NEW AND RENEWABLE ENERGY

Renewable energy sector in India is now seen as significant player in the grid connected power generation and an essential player for energy access. Renewable energy is supporting the Government agenda of 'inclusive growth' and will be part of the solution to meet the nation's energy needs. The Ministry of New and Renewable Energy, in next 5 years, is aiming towards addressing issues for accelerated exploitation of renewable energy potential. The focus would continue on development and deployment of renewable energy generation systems, wherever feasible and viable, for rural, urban and industrial/commercial applications, apart from grid-interactive renewable power.

Renewable energy in India has witnessed significant growth in recent years. There has been consistent increase in the pace of renewable energy development and the sector has grown at an annual rate of 23 per cent, about 25,000 MW in March 2012. Wind energy continues to dominate India's renewable energy industry, accounting for 70 per cent of

installed capacity (17,352 MW), followed by small hydropower (3395 MW), biomass power (3224 MW) and solar power (941 MW). In terms of electricity generation, with normative capacity utilization factors, the renewable power installed capacity is generating around 50 BU per year corresponding to about 6.5 per cent in the total electricity mix and 12.5 per cent of total capacity in 2011-12. Significantly, off-grid applications of renewable energy have also made significant head way.

The Government of India is implementing National Solar Mission, which is aiming at adding 20,000 MW solar power capacity in the country by 2022. The Phase-1 of the Mission is targeting a solar power capacity addition of 1000 MW by March 2013. Over 1040 MW of solar power projects have been installed in the year 2011-12. A major objective of the Mission is to reduce and bring the cost of solar power generation to grid parity levels. A capacity addition of about 30,000 MW is planned from various renewable Energy Technologies in the next five years. In this, wind energy would contribute about 15,000 MW and would continue to dominate India's renewable energy industry followed by solar power (10,000 MW), small hydropower (2100 MW), and biomass power (2700 MW).

(i) Jawaharlal Nehru Solar Mission—The objective of the Jawaharlal Nehru National Solar Mission (JNNSM) under the brand 'Solar India' is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The Mission has set a target of 20,000 MW and stipulates implementation and achievement of the target in 3 phases (first phase up to 2012-13, second phase from 2013 to 2017 and the third phase from 2017 to 2022) for various components including grid connected solar power. The successful implementation of the JNNSM requires the identification of resources to overcome the financial, investment, technology, institutional and other related barriers which confront solar power development in India. The penetration of solar power, therefore, requires substantial support. The policy framework of the Mission will facilitate the process of achieving grid parity by 2022. In order to facilitate grid connected solar power generation in the first phase, a mechanism of "bundling" relatively expensive solar power with power from the unallocated quota of the Government of India (Ministry of Power) generated at NTPC coal based stations, which is relatively cheaper, has been followed by the Mission. This "bundled power" would be sold to the Distribution Utilities at the Central Electricity Regulatory Commission (CERC) determined prices. The Mission provides for NTPC's Vidyut Vyapar Nigam Ltd. (NVVN) as the designated Nodal Agency for procuring the solar power by entering into a Power Purchase Agreement or PPA with Solar Power Generation Project Developers and is connected to the grid at a voltage level of 33 KV and above. For each MW of installed capacity of solar power for which a PPA is signed by NVVN, the Ministry of Power (MoP) shall allocate to NVVN an equivalent amount of MW capacity from the unallocated quota of NTPC coal based stations and NVVN will supply this "bundled" power to the Distribution Utilities.

(ii) Renewable Energy for Rural Applications—Several initiatives have been taken in this field such as ***Remote Village Electrification (RVE)*** Programme. For providing basic lighting/electricity facilities through renewable energy sources, special priority has been accorded under this scheme to villages which will not be electrified in near future. National Biogas and Manure Management Programme of the Ministry mainly caters to setting up of family type biogas plants for meeting the cooking energy needs as well as providing means of enriched organic biogas fertilizer in rural areas of the country. During the financial year 2011-12, a total of over 1.40 lakh family type biogas plants were installed across the country, taking the cumulative installations to over 45 lakh biogas fertilizer plants. The Ministry is also promoting bottling of biogas to demonstrate an Integrated Technology-package in entrepreneurial mode on medium size mixed feed ***Biogas-Fertilizer Plants (BGFP)*** for generation, purification/enrichment, bottling and piped distribution of biogas. Seventeen such projects with aggregated capacity of 33,416 cubic metres per day have been sanctioned in the States of Arunachal Pradesh, Chhattisgarh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Uttar Pradesh, Maharashtra, Punjab and Rajasthan up to 31 March 2011. The Ministry is also taking forward electrification of villages in paddy growing areas through gasification of rice husk. Rice husk based biomass gasification projects of 32 KW gasifier systems with 100 per cent producer gas engines in 60 villages/hamlets of East and West Champaran, Muzaffarpur, Lakhi Sarai districts of Bihar have been installed which are providing off-grid power to villages of 300-400 households through each system. The Projects are on Build, Own and Operate basis on a sustainable business model.

(iii) Renewable Energy for Urban Applications—A huge amount of electricity and fuel oil is being consumed in urban homes, institutions and commercial establishments for heating water for the purpose of bathing, cleaning, washing etc. Solar water heating systems being installed at these places through subsidy scheme of the Ministry have helped in significant saving of fossil fuels besides having peak load savings in many towns and cities especially during morning hours. A total of about 5.6 million sq.m. of solar collector area has been installed so far in the country.

Solar steam generating systems installed for community cooking and for process heat applications have also helped in saving of fuel oil and LPG to some extent in institutions and industrial establishments.

Buildings are major consumers of energy, consuming more than 40 per cent of total energy used globally. At present India is experiencing heavy construction activities in all spheres, thereby the energy demand is increasing rapidly. It is possible to reduce energy consumption through appropriate climate-responsive building design and energy efficiency measures. ***Green buildings*** address issues related to water and waste management, environmental, and minimum destruction of natural resources, besides the issues concerning energy supply and conservation. Keeping in view the Indian agro-climatic conditions, a National Rating System called *Green Rating for Integrated Habitat Assessment (GRIHA)* has been developed. The projects registered with GRIHA include Commonwealth Games Village Project in New Delhi. The Government of India is also implementing a scheme on "Energy Efficient Solar/Green Buildings" with the main objective to promote the widespread construction of energy efficient solar/green buildings in the country. ***Energy recovery from urban wastes*** like municipal solid wastes, food and kitchen wastes at places of community cooking/large kitchen and industrial wastes, and energy recovery and power generation from industrial wastes and effluents and co-generation are one of the priority areas of country's renewable energy program.

CHALLENGES/REFORMS

(A) Gap between Demand and Supply—The energy and peak shortage in the country during April to July 2012 was 8.4 per cent (27,892 MU) and 9 per cent (12,159 MW), respectively, as compared to 6.2 per cent (18,879 MU) and 8.2 per cent (10,263 MW) during April to July 2011. Main reasons for continuing shortage of electricity are given below:—

(a) Approximately 4.33 per cent less hydro generation as compared to the target for April to July 2012 and around 10.8 per cent less hydro generation as compared to the actual generation during April to July 2012, due to delayed and deficient monsoon.
(b) Inadequate availability of coal.
(c) Inadequate availability of gas *vis-à-vis* requirement of power stations.
(d) High cost of Regasified Liquefied Natural Gas (RLNG) and liquid fuel leading to lack of schedule from Utilities for the available generating capacity.
(e) Delay in stabilization of newly commissioned generating units.
(f) Inadequate sub-transmission and distribution network in some States.

The overall power supply position in the country during the terminal year of 10th and 11th Plan is given below:—

Power Supply Position								
Energy								
Year	Requirement		Availability		Shortage		CAGR	
	(MU)	per cent Growth	(MU)	per cent Growth	(MU)	(per cent)	Requirement	Availability
2006-07	690,587	9.3	624,495	7.9	66,092	9.6	5.74	5.26
2011-12	937,199	9.0	857,886	9.3	79,313	8.5	6.3	6.56

Peak								
Year	Demand		Met		Shortage		CAGR	
	(MW)	per cent Growth	(MW)	per cent Growth	(MW)	(per cent)	Peak Demand	Peak Met
2006-07	100,715	8	86,818	6.1	13,897	13.8	5.1	4.6
2011-12	130,006	6.3	116,191	5.3	13,815	10.6	5.2	6.0

The following measures have been taken/are being taken by the Government to improve power generation with a view to reduce the gap between demand and supply of power in the country:—

(a) Acceleration in capacity addition during 12th Plan with a target of 75,785 MW against achievement of 54,964 MW in 11th Plan.
(b) Rigorous monthly/quarterly monitoring of capacity addition of the on-going generation projects.

(c) Coordinated operation and maintenance of hydro, thermal, nuclear and gas based power stations to optimally utilize the existing generation capacity.
(d) Thrust to import coal by the Power Utilities to bridge the gap between requirement of coal and its availability from the domestic sources.
(e) Tapping of surplus power from captive power plants.
(f) Development of Ultra Mega Power Projects of 4000 MW each to reap benefits of economies of scale.
(g) Renovation, modernization and life extension of old and inefficient generating units.
(h) Strengthening of inter-state and inter-regional transmission capacity for optimum utilization of available power.
(i) Strengthening of sub-transmission and distribution network through APDRP as a major step towards loss reduction.
(j) Energy Conservation, energy efficiency and demand side management measures.

(B) Generation

Thermal—The coal based generating capacity in the country as on 30 September 2012 is 1,18,383 MW (56.44 per cent). Coal based capacity contributed approximately 68.2 per cent (310.64BU) of the total electricity generation in the country during April to September 2012.

For the year 2012-13, the generation target for coal based generation is 650 BU. This would require 476 Million Tonne (MT) of coal. Out of this, total availability of indigenous coal is 407 MT. To meet the gap between availability of indigenous coal and the demand, a target of imported coal has been fixed at 46 MT. In addition, 24 MT coal is to be imported by the power stations which are designed for imported coal.

In order to bridge the gap between requirement of coal and its availability from the domestic sources, coal is being imported for blending with plants designed for operating on domestic coal. The quantum of coal import has increased from about 4.5 MT in 2004-05 to 27.6 MT in 2011-12. About 11.6 MT coal has been imported by the power utilities during April-August 2012 against the annual import target of 46 MT.

Hydro—The Government of India has accorded high priority to the development of the hydro potential in the country. Since the combined effort of Central and State Sector developers was not enough, the new Hydro Policy, 2008 was notified on 31 March 2008 to attract the private developers as well by providing level playing field to them for development of hydro-electric projects in the country.

The status of development of hydro potential in the country as on 30 September 2012 is as follows:—

Sl.No.	Status	Nos.	Capacity (MW)
1.	Schemes under Operation	179	39,291.40
2.	Schemes under Construction	49	13,031.00
3.	DPRs Concurred by CEA (yet to be taken up for construction)	33	19,436.00
4.	Schemes for which DPRs have been prepared and are under Examination	17	10,934.00
5.	DPRs returned by Central Electricity Authority	29	9,163.00
6.	Schemes under Survey & Investigation	98	20,520.00
		405	112,375.40

Hydro projects usually have long gestation period. Therefore, the projects which are under development are likely to come up during the 13th Plan and beyond. It is evident that the new Hydro Policy, 2008 has started showing its impact, however, due to the long gestation period of hydro projects, its full impact would get reflected on the ground from 13th Plan onwards.

(C) Transmission and Distribution—Distribution is the weakest link in the power system with large losses leading to financial unviability. High technical losses in the system are primarily due to inadequate investments over the years for system improvement works, which has resulted in unplanned extensions of the distribution lines, overloading of the system elements like transformers and conductors, and lack of adequate reactive power support. The commercial losses are mainly due to low metering efficiency, theft and pilferages. This may be eliminated by improving metering efficiency, proper energy accounting & auditing and improved billing and collection efficiency. Fixing of accountability of the personnel/ feeder managers may help considerably in reduction of losses. The cash losses of utilities selling power directly to consumers, after accounting for subsidy from the State Governments, increased from Rs. 17,620 crore in year 2007-08 to Rs. 42,415 crore in year 2009-10. The cumulative book losses (on accrual basis) of State DISCOMS have increased from Rs. 79,336 crore as on 31 March 2009 to Rs. 106,347 crore at the end of year 2009-10. The net worth of the DISCOMS has decreased from Rs. 31,972 crore to Rs. 14,786 crore as on 31 March 2010. While some of the States have shown improvements in the financial health of their utilities, others are yet to demonstrate the impact of the policy initiatives.

Distribution companies have not been able to recover the cost of supply through tariff, and the gap between Average Cost of Supply (ACS) and Average Revenue Realized (ARR) has widened and the same has been increasing over the years. This gap is partly a reflection of lower tariff, but it also reflects high AT&C losses which reduce the average revenue realized.

The Comptroller and Auditor General (CAG) of India has carried out a study involving 24 utilities on issues impacting financial health of power distribution utilities in India and has pointed out the need for rationalisation of tariffs charged for various consumers. Unless the measures to contain these inefficiencies are taken, the DISCOMS will not be able to breakeven. Further, default in payments, non-metering of consumers, inadequate energy auditing, inadequate investments in up-gradation of the distribution system are some of the other issues that need to be addressed. This situation is a cause of serious concern and remedial steps need to be taken on priority basis in the 12th Plan to ensure that utilities generate adequate surpluses to support their on-going projects.

(D) Need for Coordinated Development—As mentioned in the National Electricity Policy, 'Electricity being a concurrent subject, a well-coordinated approach would be necessary for development of the power sector. This is essential for the attainment of the objective of providing electricity-access to all households in next five years and providing reliable uninterrupted quality power supply to all consumers. The State Governments have a major role, particularly in creation of generation capacity, State level transmission and distribution.' The Central Government needs to assist the States in the attainment of this objective. It should play a supportive role in fresh capacity addition and a major role in development of the National Grid. The State Governments need to ensure the success of reforms and restoration of financial health in distribution, which alone can enable the creation of requisite generation capacity.

The Regulatory Commissions should ensure that the regulatory processes facilitate the attainment of this objective. They also have a developmental role whose fulfilment would need a less formal and a consultative process.

Power Supply Position for 2012-13 (Provisional)

State/System/Region	Energy				Peak			
	April-October 2012				April-October 2012			
	Requirement	Availability	Surplus/Deficit(-)		Peak Demand	Peak Met	Surplus/Deficit(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
Chandigarh	1,102	1,102	0	0	340	340	0	0
Delhi	17,551	17,455	-96	-0.5	5,942	5,642	-300	-5.0
Haryana	26,278	23,836	-2,442	-9.3	7,432	6,725	-707	-9.5
Himachal Pradesh	5,334	5,202	-132	-2.5	2,116	1,672	-444	-21.0
Jammu and Kashmir	8,443	6,332	-2,111	-25.0	2,284	1,713	-571	-25.0
Punjab	33,153	31,016	-2,137	-6.4	11,520	8,751	-2,769	-24.0
Rajasthan	30,447	28,964	-1,483	-4.9	7,765	7,690	-75	-1.0
Uttar Pradesh	54,862	46,131	-8,751	-15.9	13,940	12,048	-1,892	-13.6
Uttarakhand	6,784	6,361	-423	6.2	1,757	1,646	-111	-6.3
Northern Region	**183,974**	**166,399**	**-17,575**	**-9.6**	**45,860**	**41,790**	**-4,070**	**-8.9**

State/System/Region	Energy				Peak			
	April-October 2012				April-October 2012			
	Requirement	Availability	Surplus/Deficit(-)		Peak Demand	Peak Met	Surplus/Deficit(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
Chhattisgarh	10,121	9,951	-170	-1.7	3,271	3,134	-137	-4.2
Gujarat	51,056	50,911	-145	-0.3	11,999	11,960	-39	-0.3
Madhya Pradesh	24,810	22,923	-1,887	-7.6	8,920	8,802	-118	-1.3
Maharashtra	74,172	71,577	-2,595	-3.5	17,934	16,765	-1,169	-6.5
Daman and Diu	1,147	1,033	-114	-9.9	311	286	-25	-8.0
Dadra and Nagar Haveli	2,657	2,487	-170	-6.4	629	629	0	0.0
Goa	1,794	1,738	-56	-3.1	452	452	0	0.0
Western Region	**165,757**	**160,620**	**-5,137**	**-3.1**	**40,075**	**39,486**	**-589**	**-1.5**
Andhra Pradesh	57,089	47,550	-9,539	-16.7	13,974	11,335	-2,639	-18.9
Karnataka	37,699	32,607	-5,092	-13.5	10,124	8,264	-1,860	-18.4
Kerala	12,328	11,907	-421	-3.4	3,578	3,262	-316	-8.8
Tamil Nadu	53,164	44,578	-8,586	-16.2	12,606	11,053	-1,553	-12.3
Puducherry	1,393	1,357	-36	-2.6	348	320	-28	-8.0
#Lakshadweep	21	21	0	0	8	8	0	0
Southern Region	**161,673**	**137,999**	**-23,674**	**-14.6**	**36,934**	**31,287**	**-5,647**	**-15.3**
Bihar	8,474	7,552	-922	-10.9	2,295	1,784	-511	-22.3
DVC	10,135	9,657	-478	-4.7	2,573	2,469	-104	-4.0
Jharkhand	3,916	3,806	-110	-2.8	1,106	1,033	-73	-6.6
Odisha	15,545	14,855	-690	-4.4	3,958	3,694	-274	-6.9
West Bengal	26,544	26,305	-239	-0.9	7,322	7,249	-73	-1.0
Sikkim	233	233	0	0.0	95	95	0	0.0
#Andaman & Nicobar Islands	141	111	-30	-21	48	48	0	0
Eastern Region	**65,552**	**62,408**	**-3,144**	**-4.8**	**16,655**	**15,415**	**-1,240**	**-7.4**
Arunachal Pradesh	355	332	-23	-6.5	116	114	-2	-1.7
Assam	3,969	3,699	-270	-6.8	1,186	1,098	-88	-7.4
Manipur	324	307	-17	-5.2	120	119	-1	-0.8
Meghalaya	1,011	862	-149	-14.7	287	279	-8	-2.8
Mizoram	230	212	-18	-7.8	68	65	-3	-4.4
Nagaland	326	306	-20	-6.1	110	109	-1	-0.9
Tripura	650	615	-35	-5.4	229	228	-1	-0.4
North-Eastern Region	**6,865**	**6,333**	**-532**	**-7.7**	**1,998**	**1,864**	**-134**	**-6.7**
All India	**583,821**	**533,759**	**-50,062**	**-8.6**	**135,453**	**123,294**	**-12,159**	**-9.0**

#Lakshadweep and Andaman & Nicobar Islands are stand-alone systems, power supply position of these does not form part of regional requirement and availability.

Note: Both peak met and energy availability represent the net consumption (including the transmission losses) in the various States. Net export has been accounted for in the consumption of importing States.

ROLE OF PARLIAMENT

The Parliament of India has been playing a very active role and brought about legislations to meet the energy needs of the society and economy. Being at the centre stage of the whole system, it enjoys special position, particularly with regard to giving sanction to the budgetary demands, laws and programmes. By making use of various procedural devices, the members of Parliament exercise oversight on the Executive for effective implementation of various programmes and schemes. Question Hour has been frequently used by members to get updated information on National Grid, quantum of withdrawal of power by various States, the measures taken to avoid grid collapse, etc. Besides, as members of different parliamentary committees, they get opportunity to exchange views and ideas among themselves and also monitor and evaluate the work done by the Government. Indian Parliament has enacted a number of laws for better management of the power sector. A quick look at these Acts follows:—

Historical Background of Legislative Initiatives

The Indian Electricity Act, 1910

- Provided basic framework for electric supply industry in India;
- Growth of the sector through licensees. Licence by State Government;
- Provision for licence for supply of electricity in a specified area;
- Legal framework for laying down of wires and other works;
- Provisions laying down relationship between licensee and consumer.

The Electricity (Supply) Act, 1948

- Mandated creation of State Electricity Boards (SEBs);
- Need for the State to step in (through SEBs) to extend electrification (so far limited to cities) across the country.

Main amendments to the Indian Electricity Supply Act

- Amendment to enable generation in Central sector;
- Amendment to bring in commercial viability in the functioning of SEBs — Section 59 amended to make the earning of a minimum return of 3 per cent on fixed assets a statutory requirement (*w.e.f.* 1 April 1985);
- Amendment to open generation to private sector and establishment of Rural Livelihood Development Companies (RLDCs);
- Amendment to provide for private sector participation in transmission, and also provision relating to Transmission Utilities.

The Electricity Regulatory Commissions Act, 1998

- Provision for setting up of Central/State Electricity Regulatory Commission with powers to determine tariffs;
- Constitution of State Electricity Regulatory Commission (SERC) optional for States;
- Distancing of Government from tariff determination.

Electricity Act, 2003—Salient Features

The provisions of this Act have been brought into force with effect from 10 June 2003 [with this, the Indian Electricity Act, 1910, the Electricity (Supply) Act, 1948 and the Electricity Regulatory Commissions Act, 1998 stand repealed]. The main features of the Act are as follows:—

(i) Generation has been delicensed and captive generation freely permitted. Hydro projects would, however, need concurrence from the Central Electricity Authority;
(ii) No licence required for generation and distribution in rural areas;
(iii) Transmission Utility at the Central as well as State level, to be a Government company—with responsibility for planned and coordinated development of the transmission network. Provision for private licensees in transmission;
(iv) Open access in transmission with provision for surcharge for taking care of current level of cross subsidy with the surcharge being gradually phased out;
(v) Distributing licensees would be free to undertake generation, and generating companies would be free to take up distribution;
(vi) The State Governments are required to unbundle the SEBs. However, they may continue with them as distribution licensees and State Transmission Utilities;
(vii) Setting up of the SERCs made mandatory;
(viii) An Appellate Tribunal to hear appeals against the decision of the CERC and SERCs;
(ix) The SERCs are required to permit open access in distribution in phases with surcharge for current level of cross subsidy to be gradually phased out along with cross subsidies and obligation to supply;
(x) Metering of electricity supplied made mandatory;
(xi) Provisions relating to theft of electricity made more stringent;
(xii) Trading as a distinct activity recognized with the safeguard of the Regulatory Commissions being authorised to fix ceilings on trading margins, if necessary;
(xiii) For rural and remote areas, stand-alone systems for generation and distribution permitted;
(xiv) Thrust to complete rural electrification and provide for management of rural distribution by panchayats, cooperative societies, non-government organizations, franchisees, etc.;
(xv) The Central Government to prepare a National Electricity Policy and Tariff Policy;
(xvi) The Central Electricity Authority to prepare a National Electricity Plan.

Parliamentary Committee—The Standing Committee on Energy is one of the Departmentally Related Standing Committees in our Parliament. The Committee consists of 31 members (21 members nominated by the Speaker, Lok Sabha, from amongst the members of Lok Sabha and 10 members nominated by the Chairman, Rajya Sabha from amongst the members of Rajya Sabha), while the Chairman is appointed by the Speaker from amongst the Lok Sabha members of the Committee. The Committee considers the Demands for Grants for the Ministry of Power and the Ministry of New and Renewable Energy Sources and makes a Report on the same to the Houses. It also examines the bill(s) referred to the Committee relating to these Ministries and considers the Annual Reports of these Ministries and makes reports thereon. This Committee, which was constituted in 1993, has since presented 154 Reports till the Fourteenth Lok Sabha.

During the Fifteenth Lok Sabha, the Committee took up Subjects like *funding of power projects, availability of gas and coal for power sector, renewable energy for rural applications, transmission and distribution systems and networks, funding of new and renewable energy projects*, etc. and made important recommendations after studying these subjects in depth and after taking study tours of the areas.

In its Eleventh Report on *Renewable Energy for Rural Applications*, the Committee noted that there was 'glaring disparity between the target set and achieved under different programmes being run by the Ministry'.

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